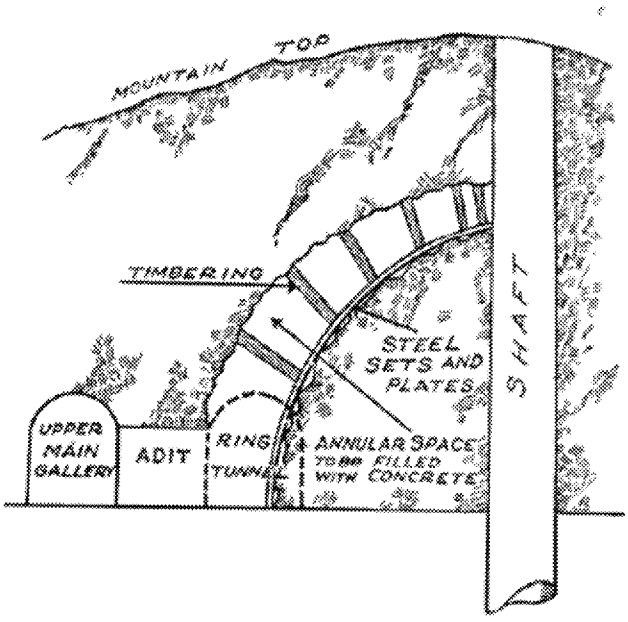
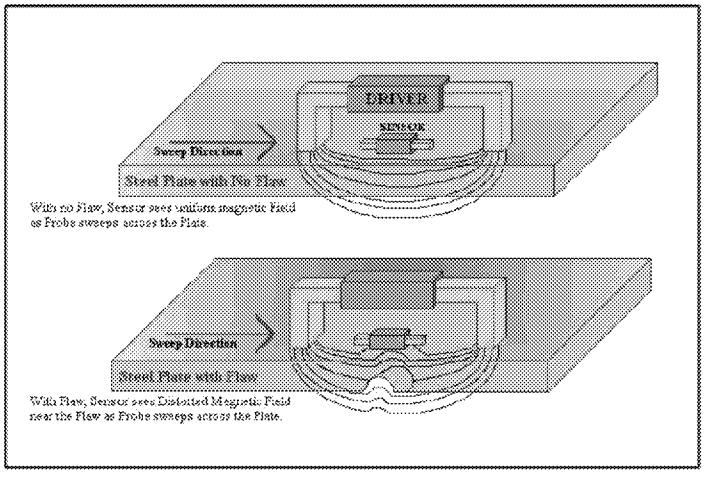
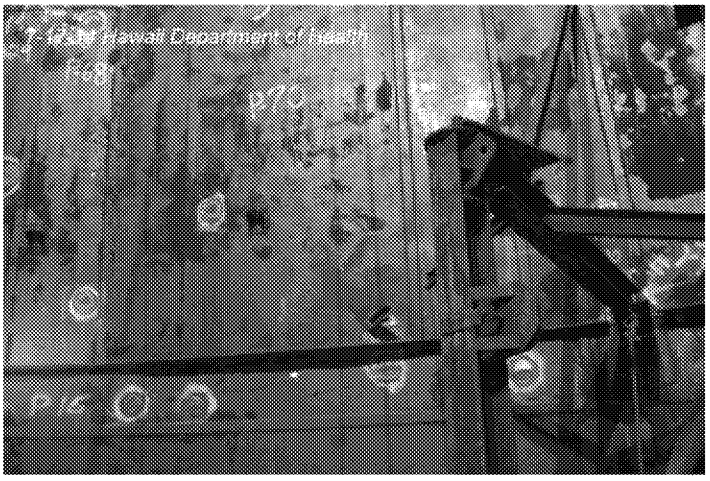
Evaluating Corrosion of the Steel Liners of the Red Hill Tanks



- How Corrosion Affects Integrity of the Red Hill Tanks Needs Further Study
- Although the Backside of the Steel Shell Cannot Be Visually Inspected, Non-Destructive Testing (NDT) Techniques Are Being Used to Identify Corrosion and Other Steel Shell Problems
- A Comprehensive Program Utilizing both Destructive and Non-Destructive Methods is Underway



Low Frequency Electronic Testing

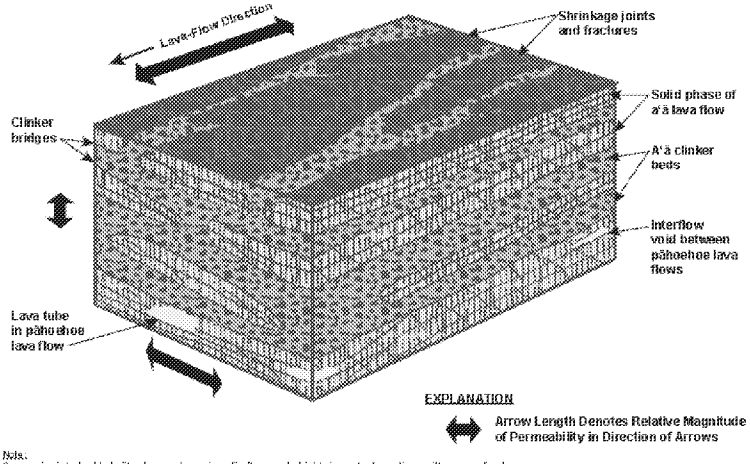


Work Being Done to Safely Store Fuel at Red Hill

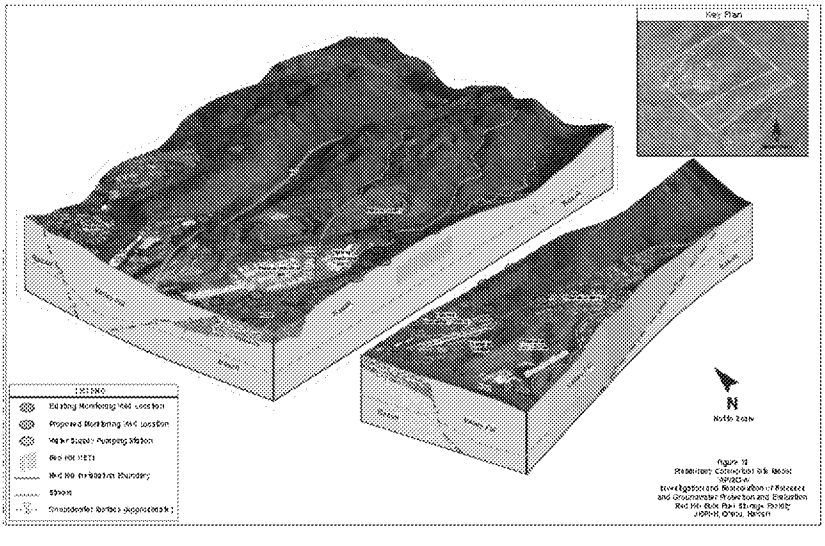
- Determine That the Combination of Technologies, Procedures, Practices, and Monitoring Are Adequate to Prevent Releases that Could Threaten Drinking Water Safety
- Determine the Probability and Magnitude of Potential Failures at the Facility is Well Understood, and Assess the Consequences of Potential Failures
- Ensure the Navy is Using Best Available Practicable Technologies for the Infrastructure
- Ensure that the Groundwater Monitoring Network and Monitoring Practices Are Protective of Drinking Water Quality

Reducing Uncertainty

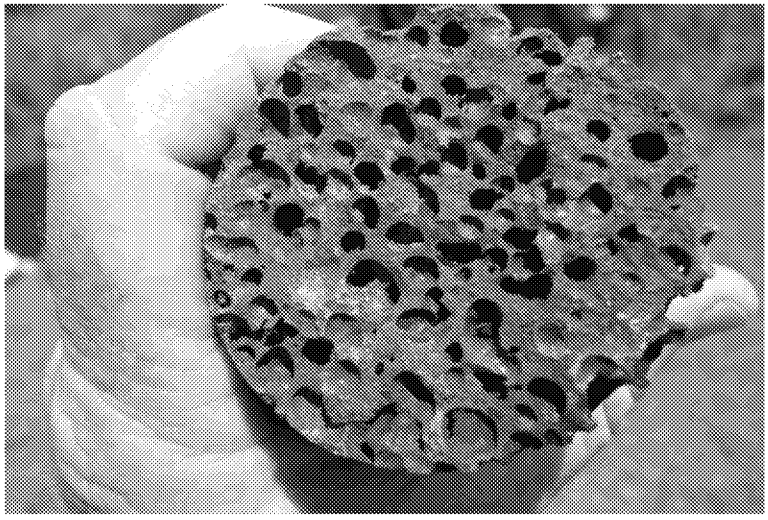
- Corrosion Rate of Steel Tank Lining
- Potential Failure Modes of Infrastructure
- Improved Tank Inspection Procedures
- Movement of Contamination in the Subsurface
- Movement of Fuel Above the Water Table
- Extent of Lateral Migration
- Groundwater Flow Directions and Rates
- Rate of Natural Degradation

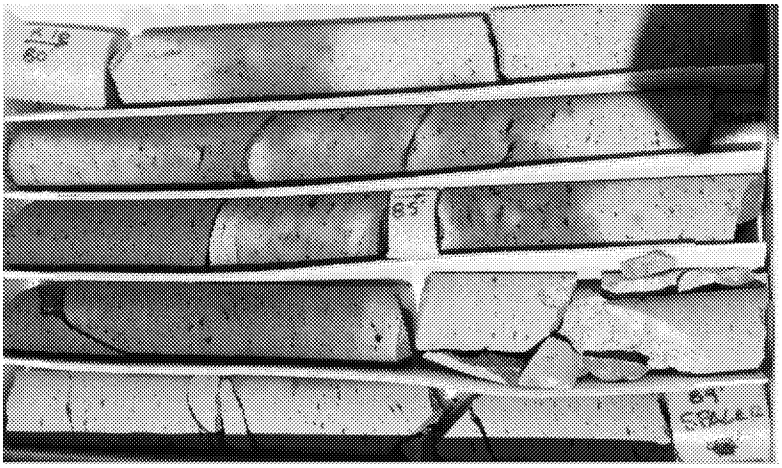


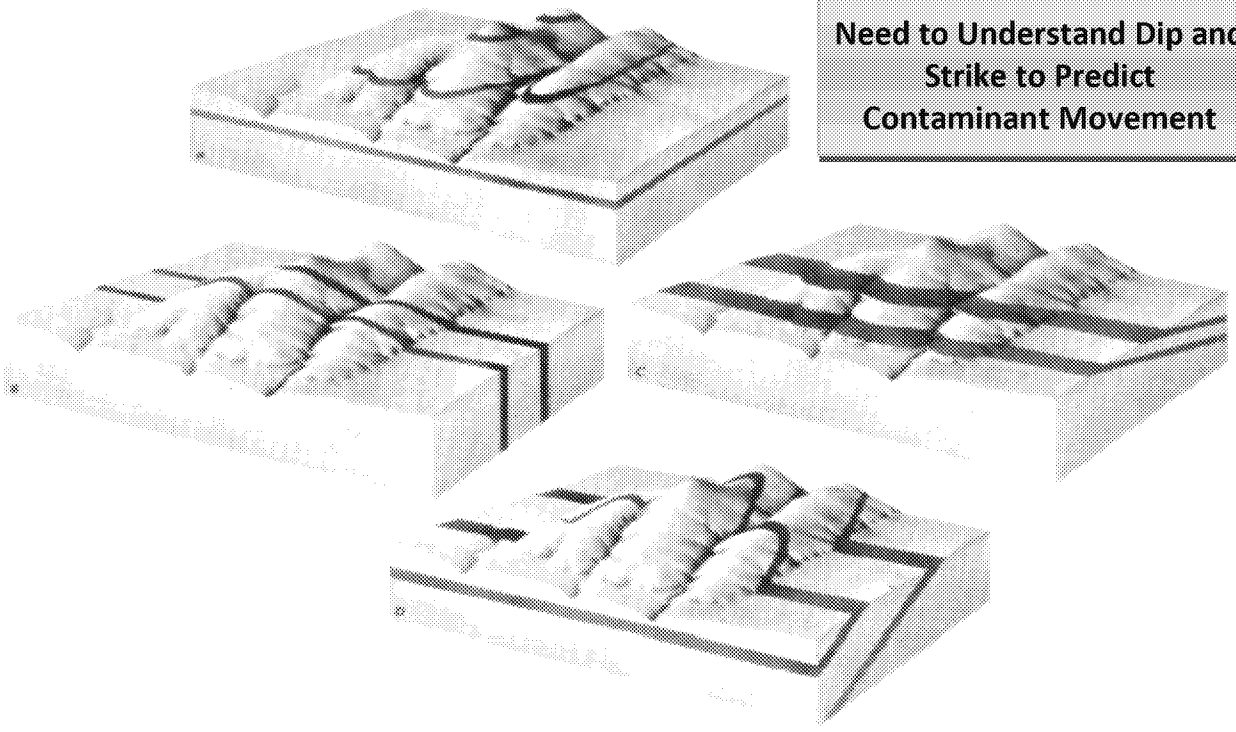
Note:
Successive interbedded pāhoehoe and massive a'ā often create highly irregular formations with various fractures and voids, intermixed with widespread areas of high horizontal permeability
(L.C. Schematic only; modified from Takasaki and Valenciano 1969.)



Work to Better Understand Red Hill Geology







Need to Understand Dip and Strike to Predict Contaminant Movement

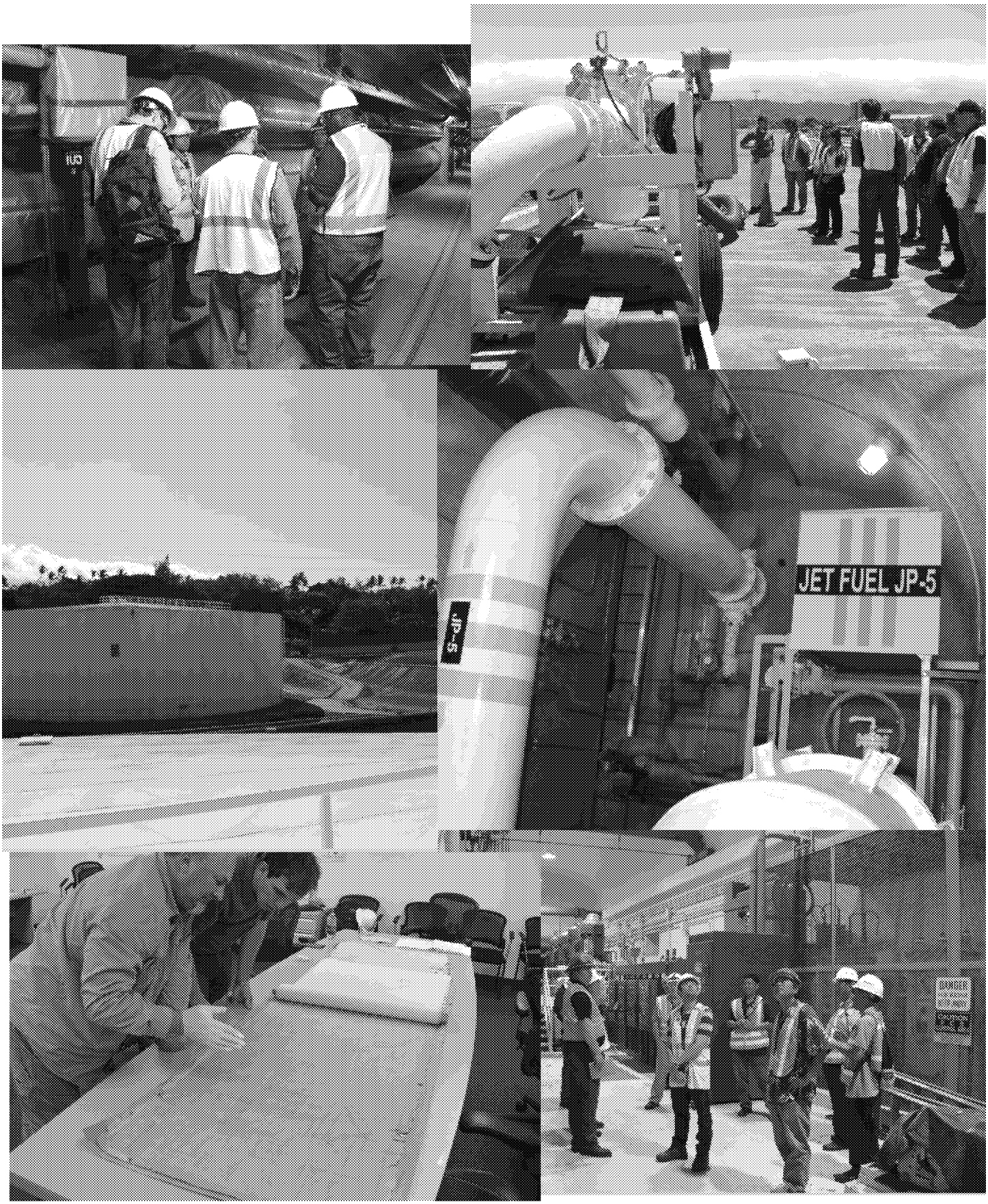
Why Did Tank 5 Leak Approximately 27,000 Gallons of Jet Fuel In January 2014?

- Patch Plates Were Installed to Address Thin Spots / Defects Identified by Non-Destructive Testing (Petroleum Industry Best Practices)
- Weld Quality on Patch Plates Likely Caused Release (Not Corrosion)
- The Quality of the Repairs Including the Welds Were Not Adequately Verified by the Navy
- Rapid Filling of Tank 5 Without the Proper Measurement Protocols Allowed the Leak to Continue
- Operators Did Not Respond Immediately to Fuel Loss Alarms

Improvements Since Tank 5 Release

- New Repair and Verification Procedures
- More Frequent Tank Tightness Testing
- New Procedures for Filling During Recommissioning After Repair
- New Alarm Response Procedures
- Improvements in Contractor Specifications

Agencies Hire Experts To Evaluate Red Hill



Tank Upgrade Alternatives
Options for Detailed Evaluation

1A Single Wall—Restoration of Tank

- Current approach to inspection and repair with enhanced TIRM

1B Single Wall—Restoration of Tank Plus Interior Coating

- Same as Alternative 1A plus coating of barrel and upper dome

1D Single Wall—Remove Steel Liner and Install New Steel Liner

- Remove existing steel liner in its entirety
- Provide new steel liner

2A Double Wall—Composite Tank with Second Steel Liner

- Existing steel liner provides secondary containment
- Construct steel liner with three inch interstitial space
- Internal coating of new steel liner

2B Double Wall—Composite Tank with Stainless Steel Liner

- Same as 2A except new internal liner is stainless steel
- No internal coating

3A Double Wall—Tank within a Tank

- Construct new steel tank with five foot accessible annular space
- Existing steel liner provides secondary containment

Tank Upgrade Alternatives
Options for Detailed Evaluation